

AMENDMENTS TO THE CLAIMS

This listing of the claims will replace all prior versions and listings of claims in the application.

1. (Cancelled)
2. (Cancelled)
3. (Cancelled)
4. (Cancelled)
5. (Cancelled)
6. (Cancelled)

7. (Currently Amended) In a multiple computer system including a plurality of single computers interconnected via a communications link, a [[A]] method of loading an application program onto each of said plurality of single computers, written to operate only on a single computer the application program having application program code including a plurality of code threads all intended to execute on and reference a single computer having a single processing unit or symmetric multiple processing units and a single independent local memory with a local memory capacity that is not shared with any other single computer of said plurality of single computers onto each of a plurality of computers, the plurality of computers being interconnectable via a communications link without forming a distributed shared memory arrangement, and different portions of said application program being simultaneously executable on each different one of the plurality of computers with each different one of the plurality of computers having a different independent local memory accessible only by a corresponding portion of the application program, the method comprising the steps of:

loading the application program written to operate only on a single computer onto each different computer of said plurality of single computers; and

modifying the application program on each said different single computer before execution of said corresponding portion of the application program written to operate only on a single computer on each said different single computer;

different portions of said application program being simultaneously executable on each different one of the plurality of single computers with each different one of the plurality of single computers having a different independent local memory accessible only by a corresponding portion of the application program.

8. (Previously Presented) The method as claimed in claim 7 wherein the step of modifying the application program is different for different computers.

9. (Currently Amended) The method as claimed in claim 7 or 8 wherein said step of modifying ~~[[step]]~~ said application program comprises:

(i) detecting instructions in the unmodified application program which ~~share~~ reference the same common memory records,

(ii) listing all such commonly referenced ~~shared~~-memory records and providing a naming tag for each said listed commonly referenced memory record,

(iii) detecting those instructions which write to, or manipulate the contents of, any of said listed commonly referenced memory records, and

(iv) generating an alert instruction ~~corresponding to each said detected~~ following each said detected commonly referenced memory record write or manipulate instruction, said alert instruction forwarding the re-written or manipulated contents and name tag of each said re-written or manipulated listed memory record.

10. (Canceled).

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

Cancel Claim 14 without prejudice

14. (Cancelled)

15. (Currently Amended) The method as claimed in claim [[14]] 31, and carried out prior to loading the application program onto each said computer.

16. (Currently Amended) The method as claimed in claim [[14]] 31, and carried out during loading of the application program onto each said computer.

17. (Currently Amended) The method as claimed in claim [[14]] 31, and carried out by just-in-time compilation.

18. (Currently Amended) The method as claimed in claim [[14]] 31, and carried out by re-compilation after loading.

19. (Canceled).

20. (Cancelled)

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Previously Presented) A method of loading an application program as in claim 7, wherein said program written to operate on only a single computer is a program written to execute within a local processor or processors and local memory coupled to the processor or processors within the single computer.

25. (Previously Presented) A method of loading an application program as in claim 7, wherein each of the computers operates with the same application program and data and thus all of the plurality of computers have the same application program and data.

26. (Currently Amended) A method of compiling or modifying an application program as in claim [[14]] 31, wherein said program written to operate on only a single computer is a program written to execute within a local processor or processors and local memory coupled to the processor or processors within the single computer.

Cancel Claim 27-28 without prejudice.

27. (Cancelled)

28. (Cancelled)

29. (Previously Presented) The method as claimed in claim 7, wherein the interconnection of the plurality of computers via the communications link without forming a distributed shared memory arrangement and the different portions of said application program being simultaneously executable on each different one of the plurality of computers with each different one of the plurality of computers having a different independent local memory accessible only by a corresponding portion of the application program eliminate clock cycle delays that would otherwise be associated with one or said plurality of computers reading memory physically located in a different one or ones of the plurality of computers formed in a distributed shared memory arrangement.

30. (Previously Presented) The method as claimed in claim 25, wherein the interconnection of the plurality of computers via the communications link without forming a distributed shared memory arrangement and the different portions of said application program being simultaneously executable on each different one of the plurality of computers with each different one of the plurality of computers having a different independent local memory accessible only by a corresponding portion of the application program eliminate clock cycle delays that would otherwise be associated with one or said plurality of computers reading memory physically located in a different one or ones of the plurality of computers formed in a distributed shared memory arrangement.

Add claims 31-47 as follows:

31. (New) A method of compiling or modifying an application program written to include a plurality of instruction code threads intended to execute on and reference only a single computer having a single central processing unit (CPU) or symmetric multiple processing units and a single independent local memory that is not shared with any other computer of said plurality of single computers but to run simultaneously on each one of a plurality of computers interconnectable via a communications link, with different portions of said application program being simultaneously executable on different ones of said plurality of single computers with each one of the plurality of single computers having the independent local memory accessible only by the corresponding portion of the application program, said method comprising the steps of:

(i) detecting instructions in the unmodified application program which reference the same common memory records;

(ii) listing all such commonly referenced memory records and providing a naming tag for each said listed commonly referenced memory record;

(iii) detecting those instructions which write to, or manipulate the contents of, any of said listed commonly referenced memory records; and

(iv) generating and inserting an alert instruction into the unmodified application program to create the modified application program for handling by a distributed run time (DRT) following each said detected commonly referenced memory record write or manipulate instruction indicating that the contents or value of the commonly referenced memory record were re-written or manipulated and may have changed during execution of a code thread, said alert instruction being operative for initiating propagation of the re-written or manipulated contents and name tag of each said re-written or manipulated listed commonly referenced memory record via the communications link to the distributed run times (DRTs) of each other of the single computers.

32. (New) A method as in claim 31, wherein the code thread that alerts the DRT to the re-writing or manipulation and possible change of contents or value of the commonly referenced memory record also performs at least one of:

(i) directly notify and propagate to all other DRTs executing on each other one of the plurality of single computers of the re-writing or manipulation and possible change of contents or value of the commonly referenced memory record and then resumes processing; and

(ii) indirectly notify and propagate by instructing another thread to notify and propagate the all other DRTs executing on each other one of the plurality of single computers of the re-writing or manipulation and possible change of contents or value of the commonly referenced memory record and then resumes processing.

33. (New) A method as in claim 31, wherein when the notification and propagation are indirect, the processing of the alert thread is only interrupted momentarily before the alert thread processing resumes and the other thread which has been notified of the re-written or manipulated commonly referenced memory record then communicates that re-written or manipulated commonly referenced memory record to each of the other single computers so that better utilization of the processing power of various executing threads and gives better scaling with increasing number of single computers when the application program is executed.

34. (New) A method as in claim 31, wherein the communication link comprises the Internet.

35. (New) A method as in claim 31, wherein the communication link comprises an intranet.

36. (New) A method as in claim 31, wherein the communication link comprises a local area network.

37. (New) A method as in claim 31, wherein the commonly referenced memory locations comprise JAVA language fields and the contents or values stored in the commonly referenced memory locations comprise Java field contents or values.

38. (New) A method as in claim 31, wherein the commonly referenced memory records comprise JAVA fields and the JAVA fields are listed by object and class.

39. (New) A method as in claim 31, wherein application program is written in the JAVA programming language the step of detecting instructions in the unmodified application program which reference the same common memory records comprise searching through the JAVA programming language code and identifying a put static (putstatic) instruction and generating and inserting an alert instruction into the application program for each said putstatic instruction so identified.

40. (New) A method as in claim 39, further comprising: modifying the application program so that during execution of the modified application program upon executing the inserted alert instruction notification, sending the commonly referenced memory record that was re-written or manipulated and may have changed during execution of a code thread with its name tag across the network and receiving the commonly referenced memory record that was re-written or manipulated and may have changed during execution of a code thread with its name tag by a different computer.

41. (New) A method as in claim 31, wherein a multicast socket is used for a distributed run time (DRT) communication of the commonly referenced memory record that was re-written or manipulated and may have changed during execution of a code thread with its name tag.

42. (New) A method as in claim 31, wherein the updating of all of the commonly referenced memory records that were re-written or manipulated and may have changed during execution of code threads are updated over the Internet.

43. (New) A method as in claim 31, wherein the communication link comprises the Internet and all updates to commonly referenced memory locations are performed using Internet network packets through separate distributed runtimes (DRTs) executing on each of the plurality of single computers.

44. (New) A method as in claim 31, further comprising writing the value from the network packet for the commonly referenced memory record that was re-written or manipulated and may have changed into the memory location of the receiving computer.

45. (New) In a multiple computer system including a plurality of single computers interconnectable via an Internet or intranet network communications link, a method of loading an original application program onto each of said plurality of single computers, the original application program having original application program code including a plurality of original code threads all written to execute on and reference a single computer having a single processing unit or symmetric multiple processing units and a single local memory with a local memory capacity that is not shared with any other single computer of said plurality of single computers, the system configured to enable simultaneous cooperative execution of said application program by said plurality of single computers, with the original application program being modified to form at least one modified application program with different portions of said modified application program being simultaneously executed within a different independent local processor and a different independent local memory within each different one of the plurality of single computers, said different independent local memory within each said different single computer not forming a distributed shared memory arrangement and being accessible

during execution of said application program and said different portions of said application program only by the different portion of the application program actually executing within the different local processing unit or symmetric multiple processing units of the different computer, the method comprising the steps of:

loading the application program onto each different computer of said plurality of single computers, said application program including a reference to a program memory field that may be references by one or more of said plurality of computers during execution of their respective different portion of the application program; and

modifying the application program on each said different single computer before execution of said different portion of the application program on each said different single computer; and

said modification of the application program includes an insertion of at least one code thread prior to execution that upon execution by one of said single computers initiates a sequence of events that result in a network packet communication over said Internet or intranet network communications link that contains an identifier of the referenced memory field and the contents or value of that memory field.

46. (New) A method as in claim 45, further comprising executing said modified application program and generating and communicating said network packet communication over said Internet or intranet network communications link that contains said identifier of the referenced memory field and the contents or value of said referenced memory field.

47. (New) A method as in claim 46, wherein further comprising executing said modified application program and generating and communicating said network packet communication over said Internet or intranet network communications link that contains said identifier of the referenced memory field and the contents or value of said referenced memory field.